Electronic Poster: Clinical track: Lung

EP-1200

Evaluation of response to stereotactic body radiation therapy for non-small cell lung cancer

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Purpose or Objective

Recommendations for surveillance after stereotactic body radiation therapy (SBRT) for early stage non-small cell lung cancer (NSCLC) are not well defined. Recently, PET response criteria in solid tumors (PERCIST) have been proposed as a new standardized method to assess radiotherapeutic response metabolically and quantitatively. The aim of this study was to evaluate therapeutic response to Stereotactic Body Radiotherapy for Early Stage Non-small Cell Lung Cancer, comparing PERCIST with the currently widely used response evaluation criteria in solid tumors (RECIST).

Material and Methods

Forty-nine patients with locally early Stage Non-small Cell Lung Cancer who received Stereotactic Body Radiotherapy were studied. Radiotherapeutic lesion responses were evaluated using CT and 18F-FDG PET according to the RECIST and PERCIST methods. The PET/CT scans were obtained before SBRT and about 3 to 6 month after SBRT. Associations were statistically analyzed between overall survival and clinicopathologic results (histology, tumor location, tumor size, lymphatic invasion, clinical stage, radiotherapeutic responses in RECIST and PERCIST).

Results

Median follow-up was 30 months. Thirteen patients had stage IA, 9 stage IB, 10 stage IIA, and 17 stage IIB biopsy-proven NSCLC. Three-year overall survival was 79.6%. CT scans indicated 3 regional recurrences. PET/d-chest indicated 3 regional recurrences and distant metastasis. There was a significant difference in response classification between RECIST and PERCIST (Wilcoxon signed-rank test, P=0.0041). Univariate analysis showed that clinical stage, RECIST and PERCIST were significant factors associated with overall survival in this study, while by multivariate analysis PERCIST was the only predictor of overall survival in early NSCLC patients. In fact, SMD, PMD/PMR, CMR in PERCIST criteria was indicative of a 9.900-fold increase in the risk of overall survival in early NSCLC patients [RR 9.900 (95% CI 1.040, 21.591), P=0.001].

Conclusion

RECIST based on the anatomic size reduction rate did not demonstrate the correlation between therapeutic responses and prognosis in patients with Early Stage NSCLC receiving SBRT. However, PERCIST was found to be the strongest independent predictor of outcomes. PERCIST might be considered more suitable for evaluation of radiotherapeutic response to NSCLC than RECIST.

EP-1201

Impact of low skeletal muscle mass on survival after SBRT for non-small cell lung cancer

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Purpose or Objective: Sarcopenia is a syndrome characterized by low muscle mass and low muscle function. Several authors reported that low skeletal muscle mass (SMM) was associated with decreased survival in cancer patients. The purpose of the present study was to retrospectively evaluate impact of SMM on survival and cause of death after stereotactic body radiotherapy (SBRT) for primary non-small cell lung cancer (NSCLC).

Material and Methods: Of consecutive 253 patients who received SBRT for primary NSCLC between 2004 and 2013, 186 patients whose abdominal CT before the treatment was available were enrolled into this study. SMM was evaluated through total psoas area (TPA) at a level of the third lumbar vertebra according to a method proposed by Jones *et al.* (*Colorectal Dis* 2015;17:O20). TPA was estimated by multiplying the greatest anterior/posterior and transverse muscle diameters and then normalizing for patient height. The patients were divided into two groups of SMM according to gender-specific thresholds for TPA. Regression analysis was done for the cumulative incidence function for competing risks of death from lung cancer and from other causes. Evaluated variates were SMM, age, gender, performance status, body mass index (BMI), Charlson comorbidity index (CCI), operability, modified Glasgow prognostic score (mGPS), recursive partitioning analysis (RPA) class, and histology. In multivariate analysis, step-wise selection was applied to identify potential factors.

Results: edian TPAs were 293 and 240 mm^2/m^2 in male and female, respectively, and these values were used as the gender-specific thresholds. Patients with lower SMM tended to be elderly and lean in BMI compared with the higher SMM. A potential median follow-up period was 55.6 months. Overall survival at 5 years was 41.1% and 55.9% in the lower and higher SMM groups, respectively (P = 0.115). Cumulative incidence of non-lung cancer death was significantly worse in the lower SMM (31.3% at 5 years compared with 9.7% in the higher SMM, P = 0.006). Multivariate regression analysis identified SMM and operability as significant factors for non-lung cancer death (**Table**). Impact of SMM on lung cancer death was not significant with cumulative incidence of 27.6% and 34.4% at 5 years in the lower and higher SMM groups, respectively (P = 0.332).

		Univariate		Multivariate	
		HR	P-value	HR	P-value
SMM	Lower vs higher	2.60	0.006*	2.66	0.004*
Age	>75y vs ≤75y	2.01	0.078	1.96	0.094
Gender	Male vs female	1.88	0.140		
PS	1 vs 0	0.78	0.042*		
	2–3 vs 0	2.68			
BMI	Lean vs normal	2.43	0.046*		
	Obese vs normal	1.09			
CCI	1–2 vs 0	5.75	0.059	3.71	0.096
	≥3 vs 0	9.10		6.24	
Operability	inop vs operable	2.60	0.015*	2.22	0.040*
mGPS	1–2 vs 0	1.45	0.260		
T-stage	1b vs 1a	1.00	0.702		
	2a vs 1a	0.72			
RPA class	II vs I	1.27	0.460		
Histology	Sq vs Ad	1.13	0.987		
	Others vs Ad	1.03			
	Unproven vs Ad	1.14			

Table. Univariate and multivariate regression analysis for non-lung-cancer death

Abbreviations: SMM = skeletal muscle mass, PS = performance status, BMI = body mass index, CCI = Charlson comorbidity index, mGPS = modified Glasgow prognostic score, RPA = recursive partitioning analysis

BMI was classified into lean (<18.5), normal and obese (≥25.0). RPA class I is female or patients with T1a. mGPS of 0 was defined as CRP<0.3 mg/dL and albumin>3.5g/dL.

Conclusion: Low SMM is a significant risk factor for non-lung cancer death after SBRT for NSCLC.